narda
Safety Test Solutions

ELECTRIC AND MAGNETIC FIELD ANALYZER

EHP-50F

Conforms to EMF Directive 2013/35/EU

Selective and broadband low frequency field analysis

- **Precise measurement of electric and magnetic fields with just one device**
- **Wide frequency range from 1 Hz to 400 kHz with high measurement dynamic range**
- **FFT method for selective and wideband measurement in all 3 spatial directions**
- **Weighted Peak measurements in accordance with *ICNIRP 2010*, *ICNIRP 1998* and *EMF Directive 2013/35/EU***
- **Time domain measurement method for exact capture of complex signal shapes**
- **Optical interface for remote control and result display avoids distortion of the field under test**
- **Autonomous measurement operation for up to 36 hours with built in data logger**
- **Control and display using a PC or the NBM-550 Broadband Field Meter**

EHP-50F

APPLICATION

Low frequency fields are present throughout our environment. They occur wherever electrical energy is generated, distributed or used. Thus, they are present in our homes, our places of work, in medical facilities, and even outside in the open air where high-tension cables for energy distribution may be found. Magnetic fields occur primarily wherever high currents flow; electric fields wherever high voltages are present. It is virtually impossible to avoid their influence, which makes it all the more important to understand how they affect us and to prevent possible interactions by means of measurement and suitable countermeasures.

Fields occur when electrical energy is generated

Examples of places where strong LF fields occur:

- Power supply stations and transformers
- High-tension lines
- Electric motors, railroads
- Industrial equipment for welding, tempering, and smelting
- Galvanizing equipment, chlorine manufacturing
- Medical technology, MRI

… where electrical energy is distributed

Fixed limit values for protection

To protect people at work, the European Union has issued the EMF Directive 2013/35/EU. This obligates every company in the EU to carry out a risk assessment with regard to field exposure for every place of work. Mandatory minimum limit values for fields have been set, which come into force and must be met by mid-2016 at the latest.

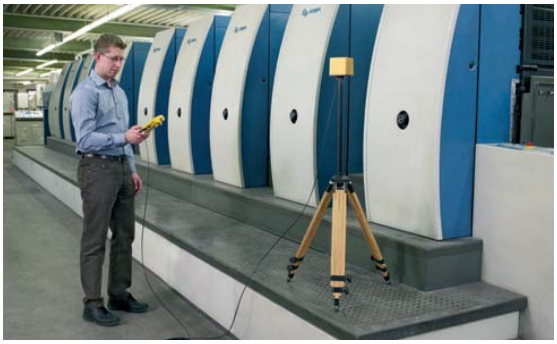
International standardization bodies and organizations such as WHO, ICNIRP, IEC, IEEE, and CENELEC, as well as national authorities have for many years been working on establishing and updating the immission protection limit values or on product standards. There is no dispute about the short-term effects of high frequency and low frequency fields. Limits for the general public and in the workplace are in force practically everywhere around the world. However, such limit values on their own are not enough to protect people. They must also be verified by calibrated measurement to make certain.

… and where electrical energy is used

DESCRIPTION

The EHP-50F is a LF analyzer in a particularly compact package, which is equipped with E field and H field sensors for all three spatial dimensions. It can therefore make frequency selective, non-directional measurements of electric and magnetic fields with high accuracy and dynamic range.
The built in tripod bush and remote operation via optical cable mean that the EHP-50F can be optimally positioned at the place of measurement without causing distortion in the field due to the presence of any person. Operation can be from a PC using Windows® based software or from the Narda NBM-550 basic unit.
The EHP-50F can perform fully automatic long-term measurements for up to 36 hours in standalone operation, storing the results in the device itself.

The compact case of the EHP-50F contains all the technology for measuring E fields and H(B) fields



Occupational safety personnel check the EMF immission of industrial plant

FFT spectrum analysis

The limit values for electromagnetic fields in the low frequency range are very strongly dependent on frequency. As a result, a wideband measurement is often not enough to sufficiently assess the signals. Spectrum analysis is then needed. This shows the exact distribution of frequency components making up the signal.
The powerful FFT analysis provided by the EHP-50F covers a broad frequency range from 1 Hz to 400 kHz in several sub-ranges. Lower frequencies are captured with a narrow resolution bandwidth and high resolution; higher frequency ranges use broader resolution, which results in faster measurement performance.
Measurement of the electric or magnetic field spectrum takes place simultaneously in all axes and also gives the wideband value for the recorded frequency range at the same time.

Weighted Peak method WPM

The kinds of field signal sequences that are encountered are becoming more and more complex, such as those caused by current pulses during resistance welding. The Weighted Peak method gives the correct measured value even for such pulsed signals, and also takes the phases of the different frequency components into account. This saves users a lot of work, since they only need to select the relevant standard. The device then directly gives a meaningful result expressed as a percentage of the limit value.
The EHP-50F uses a Weighted Peak evaluation with convolution in the time domain that conforms to ICNIRP 2010 and IEC 61786-2. The measurement covers the entire frequency range from 1 Hz to 400 kHz. A graph shows the measured value versus time.

Weighted Peak method

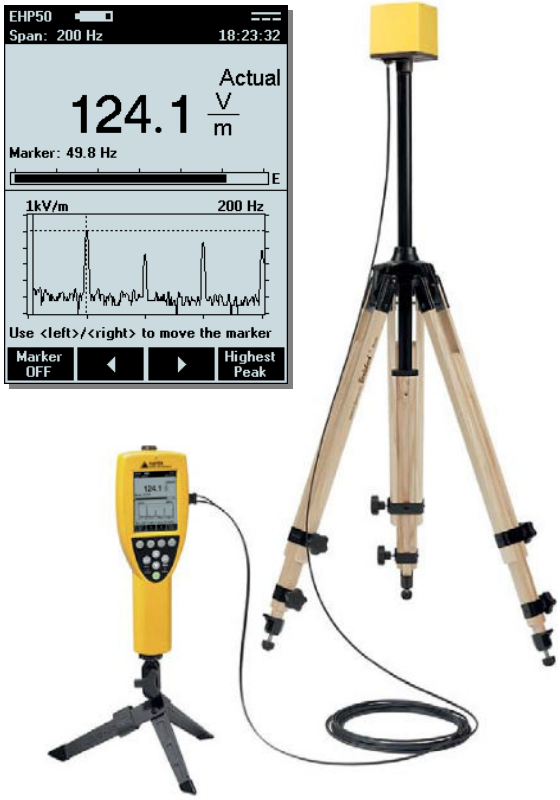
for EHP-50F, complies with IEC 61786-2

For exposure evaluation according to:
ICNIRP 1998, general public
ICNIRP 1998, occupational
ICNIRP 2010, general public
ICNIRP 2010, occupational
Directive 2013/35/EU, Limbs Action Levels
Directive 2013/35/EU, High Action Levels
Directive 2013/35/EU, Low Action Levels
EMFV 2016, Low Action Levels

CONTROLLING THE EHP-50F

Controlling measurements from NBM-550

All the major measurement functions of the EHP-50F can be remote controlled from the NBM-550 Field Measuring Set. To do this, the EHP is connected to the NBM using an optical control cable (POF duplex). The NBM then displays the measured values transferred from the EHP. The NBM offers distinct operating advantages over a laptop in harsh environments or in strong sunlight. The measurement data is saved in the NBM and can subsequently be evaluated and documented using the NBM-TS PC software. This measurement solution is particularly advantageous to all users wanting to measure RF fields as well as LF fields.



Measurement controlled by NBM-550

Standalone mode measurements

This operating mode is ideal for long-term measurements, allowing a recording time of up to 36 hours without the need for an additional power supply. The analyzer is preconfigured using the software and can then measure the wideband value and the maximum value occurring in the spectrum (E or H field). Up to two measurement sequences per minute are performed fully automatically and the results are saved in the data logger. These can be read out and evaluated at a convenient time later on. Alternatively, the weighted peak value can be measured in the time domain.

Controlling measurements from PC

The EHP-50F can be operated directly through the optical cable by remote control from a Windows based PC running the EHP50-TS software. This measurement solution is ideal for the laboratory environment and for detailed display of the result spectrums. The EHP50-TS software provides additional measurement features when compared with control from the NBM, such as:

- Spectrogram and waterfall displays
- Isotropic spectrum and additional display of X, Y, Z
- Simultaneous E field and H field measurement
- Measurement of electrical signals (via Aux input)

Measurement controlled by PC with EHP50-TS

SPECIFICATIONS

EHP-50F				
Measurement principle		• Fast Fourier Transformation for frequency domain measurements (1024 point FFT) • Weighted Peak Method (WPM) in the time domain		
Field sensors		• Orthogonally arranged coils for the magnetic field (sensor area 35 cm^2) • Orthogonally arranged plate electrodes for the electric field (sensor area 50 cm^2)		
FEATURES AND FUNCTIONS				
EHP-50F Control		**NBM-550**	**PC software EHP50-TS**	**Standalone mode without display**
Measurement functions	Spectrum analysis with marker evaluation	Spectrum, isotropic Standard, isotropic (spectrum related to a standard, displayed in percent)	Spectrum, isotropic and X,Y,Z Standard, isotropic and X,Y,Z (spectrum related to a standard, displayed in percent) Spectrogram	-
	Highest Peak (highest spectral line)	Isotropic and X,Y,Z		
	Wideband			
	Weighted Peak	Isotropic or X,Y,Z with graph over time		Isotropic and X,Y,Z
Weighted Peak according IEC 61786-2 (time domain), selectable standards		EMF Directive 2013/35/EU, Limbs Action Levels EMF Directive 2013/35/EU, High Action Levels EMF Directive 2013/35/EU, Low Action Levels EMFV 2016, Low ALs ICNIRP 2010 Occupational or General Public ICNIRP 1998 Occupational or General Public		-
Additionally selectable standards to be displayed as a limit trace or as a standard related spectrum (more standards can be added by the user)		ICNIRP 2020 IEEE C95.1-2019 GB8702-2014 BGV B11		-
		Safety Code 6 1999	IEEE C95.6-2002	
Data logging with Auto Save	Spectrum	-	As a spectrogram or as separate text files for each spectrum	-
	Highest Peak or Wideband	Programmable timer Storage interval 1 s to 6 min Battery life > 9 h	-	Storage interval 30/ 60 s Battery life up to 36 h
PC software		"NBM-TS" Evaluation, report and export	"EHP50-TS" Measurement, evaluation and save to file	"EHP50 Logger" Configuration, read-out and save to file
Result type/ acquisition	Spectrum analysis and Standard	Actual value (sample) Average Max Hold		-
	Highest Peak or Wideband			Actual value (sample) RMS/linear/median averaging
	Weighted Peak (graph over time)	200 values, rolling memory, time span 100 s to 2000 min		-
Averaging method		Moving RMS average over 4/8/16 or 32 values	Moving RMS average over 30 s to 30 min	RMS, linear and median over all values
AUX signal input		Single channel input for analyzing electrical signals ranging from 30 nV to 1 V. The measurement must be controlled by the PC software EHP50-TS. Coaxial jack type MMCX, input impedance 1 kΩ		
Data interface		Measurement control using the NBM-550 display unit or the PC software Optical POF interface, duplex 2 x 1000 µm RP-02, 38400 Baud, up to 40 m length **Note: user specific remote operation is not supported**		

FREQUENCY					
	Range (SPAN)	**Fstart**	**Fstop**	**Resolution**	**Bandwidth RBW (-3dB)**
All measurement functions except Weighted Peak	400 kHz [a]	4800 Hz	400 kHz	976.56 Hz	3600 Hz
	100 kHz	1200 Hz	100 kHz	244.14 Hz	900 Hz
	10 kHz	120 Hz	10 kHz	24.414 Hz	90 Hz
	2 kHz	24 Hz	2 kHz	4.8828 Hz	18 Hz
	1 kHz	12 Hz	1 kHz	2.4414 Hz	9 Hz
	500 Hz	6 Hz	500 Hz	1.2207 Hz	4.5 Hz
	200 Hz [a]	2.4 Hz	200 Hz	0.48828 Hz	1.8 Hz
	100 Hz [a]	1 Hz	100 Hz	0.24414 Hz	0.9 Hz
Weighted Peak mode		1 Hz to 400 kHz			

LEVEL [b]		Electric Field	Magnetic Field
Level range (frequency-dependent)	Low Range	5 mV/m to 1 kV/m	0.3 nT to 100 µT
	High Range [c]	500 mV/m to 100 kV/m	30 nT to 10 mT
Overload level (High Range)		200 kV/m (≤ 3 kHz)	20 mT (at 50 Hz)
Dynamic range		106 dB	110 dB
Display resolution (NBM-550)	Low Range	4 digits, ≥ 1 mV/m	4 digits, ≥ 0.1 nT
	High Range	4 digits, ≥ 0.1 V/m	4 digits, ≥ 0.1 µT
DANL displayed average noise level (f ≥ 50 Hz and SPAN ≤ 1 kHz)		5 mV/m (isotropic) 3 mV/m (single axis)	0.3 nT (isotropic) 0.2 nT (single axis)
E/H field immunity		< 10 V/m @ 1 mT (H field)	< 0.2 µT @ 20 kV/m (E field)

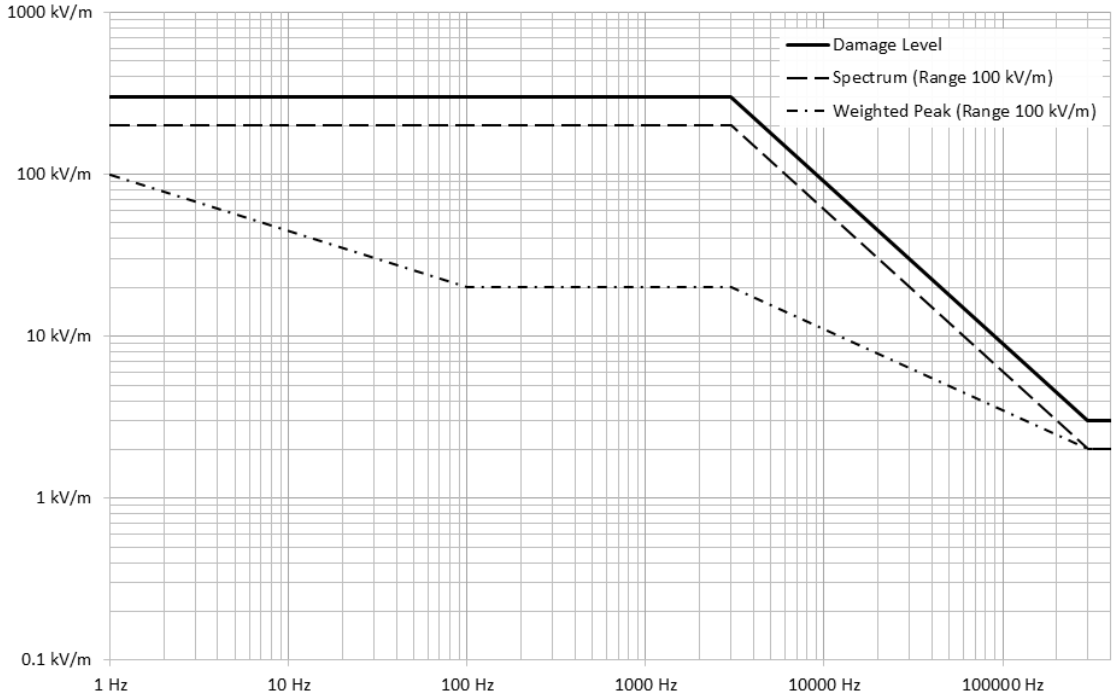
UNCERTAINTY [b]		Electric Field	Magnetic Field
Flatness @ 100 V/m, 3 µT	5 Hz to 40 Hz	±0.35 dB	±0.5 dB
	40 Hz to 300 kHz		±0.35 dB
	300 kHz to 400 kHz		±0.5 dB
Linearity (referred to 100 V/m, 3 µT)		±0.2 dB (1 V/m to 1 kV/m)	±0.2 dB (200 nT to 10 mT)
Isotropic response		±0.54 dB typ.	±0.12 dB typ.
Temperature deviation (typ. at 55 Hz) (referred to 23 °C, 50 % relative humidity)		-0.004 dB/°C (-20 °C to 55 °C)	-0.008 dB/°C (-20 °C to 23 °C) +0.013 dB/°C (23 °C to 55 °C)
Humidity deviation (typ. at 55 Hz) (referred to 23 °C, 50 % relative humidity)		+0.011 dB/% (10 % - 50 % humidity) +0.022 dB/% (50 % - 90 % humidity)	-0.007 dB/% (10 % - 50 % humidity) +0.01 dB/% (50 % - 90 % humidity)
Expanded measurement uncertainty [d] in Spectrum mode		±8.1 % (50/60 Hz, 1 V/m to 40 kV/m) ±10.3 % (5 Hz to 100 kHz, 1 to 1000 V/m)	±4.3 % (50/60 Hz, 50 nT to 3 mT) ±5.9 % (5 Hz to 100 kHz, 50 nT to 10 µT)
Expanded measurement uncertainty [e] in Weighted Peak mode		±9.7 % (3 Hz to 300 kHz)	±4.6 % (15 Hz to 100 kHz) ±8.6 % (3 Hz to 300 kHz)

GENERAL SPECIFICATIONS		
Recommended calibration interval		24 months (calibration data stored in the internal EEPROM)
Tripod support		Threaded insert UNC ¼“
Internal battery		Li-Ion, rechargeable, 3.7 V / 5.4 Ah
Operating time		> 9 hours Up to 36 hours in standalone mode
Recharging time		< 6 hours
External supply		10 to 15 VDC, 500 mA (barrel connector 3.5/1.35 mm positive pole inside)
Temperature	Operation	-20 °C to +55 °C
	Storage	-30 °C to +75 °C
	Charging	0 °C to + 40 °C
Humidity (operation)		0 to 95 % relative humidity, non-condensing
Ingress protection		Class IP42
Dimensions (H x W x D)		109 mm x 92 mm x 92 mm (without tripod)
Weight		550 g (without tripod)
Country of origin		Italy

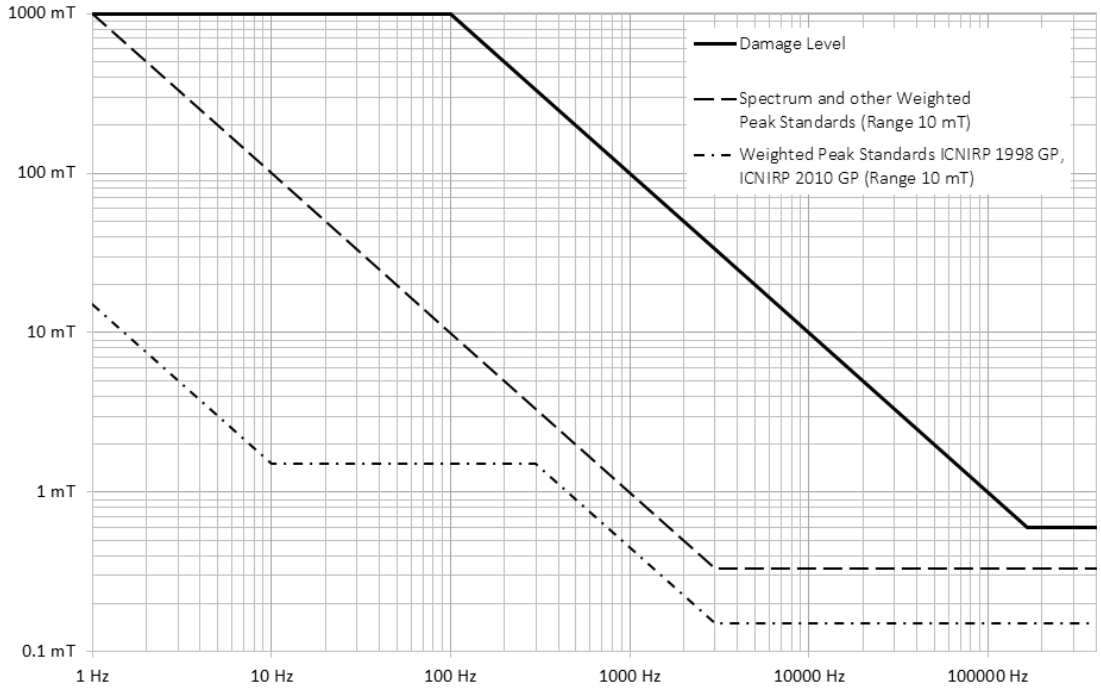
a) Not available for standalone operation
b) Unless otherwise stated, these specifications apply for an ambient temperature of 23 °C and a relative humidity of 50 %
c) Values are nominal levels. The frequency dependent upper measurement range limits are shown in the following diagrams
d) Uncertainty includes flatness, linearity and isotropic deviations for a continuous wave signal (CW) and a confidence level of 95 %
e) Below 3 Hz and above 300 kHz the uncertainty increases to ±0.85 dB (band-limiting filter not considered)

Upper measurement range limits

Electric field (RMS)



Magnetic field (RMS)



ORDERING INFORMATION

EHP-50F	Part number
Option for NBM-550	
EHP-50F E&H Field Analyzer Set, 1Hz-400kHz, for NBM-550 Set includes: - EHP-50F Basic unit - EHP-TS PC Software (Manual on CD) - Tripod Extension, 0.50m - AC/DC Battery Charger - Certificate of calibration - O/E Converter USB, RP-02/USB - Optical Bridge Connector RP-02 - Cable, FO Duplex, RP-02, 10m - Foam inserts for EHP-50 (to fit into NBM case)	**2404/103**
Stand-alone / PC version	
EHP-50F E&H Field Analyzer Set, 1Hz-400kHz, Standalone/PC use Set includes: - EHP-50F Basic unit - EHP-TS PC Software - Tripod Extension, 0.50m - Mini Tripod, Benchtop - AC/DC Battery Charger - Certificate of calibration - O/E Converter USB, RP-02/USB - Optical Bridge Connector RP-02 - Cable, FO Duplex, RP-02, 10m - Soft carrying case - User manual EHP-50 (printed)	**2404/104**
Complete set with NBM-550	
NBM-500 Set 13, 1Hz-6GHz, with EHP-50F, NBM-550, EF0691 Set includes: - NBM-550 Basic Unit - Hardcase NBM Series, 5 Probes - Power Supply 9VDC, 100V-240VAC - Battery, Rechargeable, NiMH - Shoulder Strap, 1m - Tripod, Benchtop, 0.16m - Cable, USB Interface - Software, NBM-TS - Operating Manual NBM-550 - Probe EF 0691, E-Field - EHP-50F Basic Unit - Foam Inserts for EHP-50 (to fit into NBM case) - EHP-TS PC Software - Tripod Extension, 0.50m - AC/DC Battery Charger - O/E Converter USB, RP-02/USB - Cable, FO Duplex, RP-02, 10m - Optical Bridge Connector RP-02 - Tripod, Non-Conductive, 1.65m - Certificates of calibration	**2400/113**
Optional accessories	
Tripod, Non-Conductive, 1.65m with Carrying Bag	**2244/90.31**
O/E Converter RS232, RP-02/DB9	**2260/90.06**
Cable, FO Duplex, RP-02, 2m	**2260/91.02**
Cable, FO Duplex, RP-02, 5m	**2260/91.09**
Cable, FO Duplex, RP-02, 10m	**2260/91.07**
Cable, FO Duplex, RP-02, 20m	**2260/91.03**
Cable, FO Duplex, RP-02, 50m	**2260/91.04**

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